

developing unit while depositing toner particles on an electrostatic latent image on the image-bearing surface of the photoreceptor as the photoreceptor moves adjacent to the elongated opening.

Remarks

Claims 1-10 are currently pending. Applicant has included herewith an Appendix including the revised abstract and all of the claims pending in this Application following entry of the present amendment. Entry and reconsideration is respectfully requested.

The Examiner objected to the title as purportedly being not descriptive. Applicants have set forth a new title that more specifically describes the presently claimed invention. Withdrawal of the present objection is requested.

The Examiner objected to the abstract. Applicant have proposed corrections to the abstract, which it believes should serve to remove the Examiner's concerns. Accordingly, Applicant requests that this objection also be removed.

The Examiner objected to the drawings for various informalities. Applicant submits that the proposed correction rectify each of the objections noted by the Examiner. Consequently, Applicant respectfully requests that the Examiner acknowledge the sufficiency of the proposed corrections and allow entry of same.

Applicant notes that Claims 1 and 6 have been amended to more clearly set forth Applicant's claimed invention and to correct potential antecedent basis problems.

Claim 1 stands rejected under 35 U.S.C. 102(b) as being purportedly anticipated by Zin U.S. Patent No. 3,196,832 or Hansen U.S. Patent No. 3,176,653. Claim 2 is rejected under 35 U.S.C. 103(a) as being purportedly obvious over Zin or Hansen. Claims 4-7, 9 and 10 stand rejected under 35 U.S.C. 103(a) as being purportedly obvious over Zin or Hansen, as applied to Claims 1 and 2, and further in view of Caruthers U.S. Patent No. 5,899,605. Claims 3 and 8 are

objected to as being dependent on a rejected claim. Applicant respectfully traverses the objections as to Independent Claims 1 and 6.

Applicant respectfully submits that the prior art does not disclose or fairly teach an “air duct, provided around the elongated opening of the developing unit, containing air flow therein having a predetermined air pressure to hold a liquid developer within a space substantially between the elongated opening and the image-bearing surface.” Specifically, Zin discloses a single applicator head that passes adjacent to electrophotographic paper. The applicator head has a central channel, a rectangular slot, and a rectangular channel disposed between the central channel and the rectangular slot. Liquid developer flows through the central channel and onto the paper. Air is then ejected through the rectangular slot to form an air curtain. The air curtain prevents the liquid developer from flowing outside the area on the paper underneath the central channel and the rectangular channel. The air that is ejected through the rectangular slots also picks up the excess liquid developer on the sheet and carries it away through the rectangular channel.

Similarly, Hansen also discloses an applicator head that has an elongated slot to supply developer to the paper, an adjacent channel to provide a return path for excess developer, and a rectangular channels to pump air onto the paper. As in Zin, an air curtain is formed in Hansen to prevent the liquid developer from flowing outside the area on the paper underneath the elongated slot and the adjacent return channel. Also as in Zin, in Hansen the air impinging on the paper picks up the excess developer and carries it into the adjacent return channel.

In contrast, amended Claim 1 of the present inventions states that the liquid developer is held in a space “between the elongated opening and the image-bearing surface” and Claim 6 states that the liquid developer is “retained adjacent to the elongated opening in the developing unit while depositing toner particles on the electrostatic latent image.” The air pressure from the

air ducts in the present invention prevents excess liquid from flowing onto the image-bearing surface. As the electrostatic image moves past the developing unit, toner particles are withdrawn from the developer and adhered onto the electrostatic latent image, and any non-deposited toner is retained adjacent to the elongated channel by the air pressure from the air ducts. As such, the developer in the present invention is retained substantially within the space between the elongated opening and the image-bearing surface, whereas in Zin and Hansen, the developer flows outside the area of the central channel and to a second channel used for removing the excess developer. As a result of the design in the present invention, among other potential advantages, there is no need for extra channels to flush away excess developer allowing the developer to be physically smaller than was possible in the prior art. Thus, it cannot be said that either Zin or Hansen makes the present invention obvious let alone anticipate it.

For the aforementioned reasons, it is respectfully submitted that Independent Claims 1 and 6, as well as dependent Claims 2-5, and 7-10 are allowable over the prior art, and that the application is in condition for allowance. Notice to that effect is requested.

Any questions should be directed to the undersigned.

Respectfully submitted,

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April 16, 2002

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APPENDIX

- A1
1. A liquid electrophotographic developing apparatus, comprising:
a developing unit, having an elongated opening disposed adjacent to a moving image-bearing surface of a photoreceptor, for converting an electrostatic latent image into a toner image; and
an air duct, provided around the elongated opening of the developing unit, containing air flow therein having a predetermined air pressure to hold a liquid developer within a space substantially between the elongated opening and the image-bearing surface while permitting toner particles in the liquid developer deposited on the image-bearing surface to be retained by the image-bearing surface and allowing volatile solvent in the developer to be vaporized into the surrounding atmosphere.
 2. The liquid electrophotographic developing apparatus according to claim 1, wherein the air duct is provided with air pressure control means for maintaining the air flow at a predetermined pressure.
 3. The liquid electrophotographic developing apparatus according to claim 2, wherein the air pressure control means comprises an air pressure sensor and a flow control valve.
 4. The liquid electrophotographic developing apparatus according to claim 1, wherein the developing unit is provided with flow control means for controlling flow of the liquid developer.
 5. The liquid electrophotographic developing apparatus according to claim 4, wherein the flow control means comprises a flow pressure sensor and a control valve.

6. A liquid electrophotographic developing apparatus, comprising:
a plurality of developing units, each having an elongated opening disposed adjacent to a moving image-bearing surface of a photoreceptor which passes adjacent to the plurality of developing units in succession, for converting an electrostatic latent image into a toner image, each of the plurality of developing units containing a liquid developer of a different color; and

a plurality of air ducts, each provided around the elongated opening of the developing unit, containing air flow therein having a predetermined air pressure, for causing the liquid developer to be retained adjacent to the elongated opening in the developing unit while depositing toner particles on an electrostatic latent image on the image-bearing surface of the photoreceptor as the photoreceptor moves adjacent to the elongated opening.

7. The liquid electrophotographic developing apparatus according to claim 6, wherein the air duct is provided with air pressure control means for maintaining the air flow at a predetermined pressure.

8. The liquid electrophotographic developing apparatus according to claim 7, wherein the air pressure control means comprises an air pressure sensor and a flow control valve.

9. The liquid electrophotographic developing apparatus according to claim 6, wherein the developing unit is provided with flow control means for controlling flow of the liquid developer.

10. The liquid electrophotographic developing apparatus according to claim 9, wherein the flow control means comprises a flow pressure sensor and a control valve.

ABSTRACT OF THE DISCLOSURE

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A liquid electrophotographic developing apparatus including a developing unit and an air duct. The developing unit has an elongated opening disposed adjacent to a moving image-bearing surface of a photoreceptor, and it is used for converting an electrostatic latent image into a toner image. The air duct is provided around the elongated opening of the developing unit, and air flow therein has a predetermined air pressure to hold a liquid developer within a space substantially between the elongated opening and the image-bearing surface while permitting toner particles in the liquid developer deposited on the image-bearing surface to be retained by the image-bearing surface and allowing volatile solvent in the developer to be vaporized into the surrounding atmosphere.
